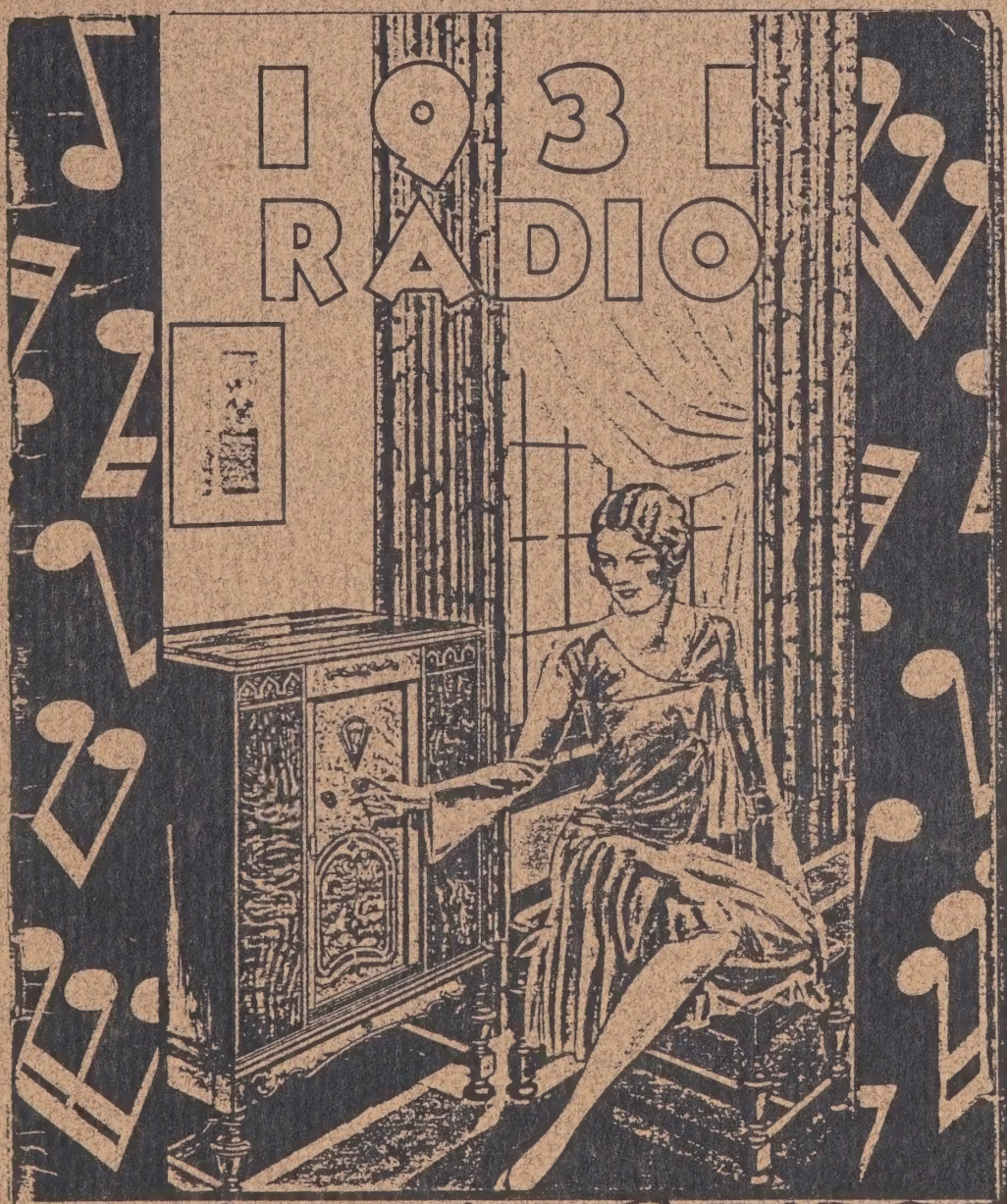




ARIZONA ANTIQUE RADIO CLUB NEWS

Vol.V, No.3

Spring, 1988



ARIZONA *The* ANTIQUE RADIO CLUB

is a non-profit organization dedicated to preserving the history and artifacts of radio. The club is organized primarily for the mutual assistance and association of radio devotees and collectors in Arizona. Membership, however, is open to all persons who have an interest in radio history or collecting.

Membership

Dues are \$10.00 per year and provides the member access to all club functions and publications. Applications may be obtained by writing or calling the Secretary-Treasurer, Lois Watson.

Officers

PRESIDENT

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Combined Meeting

Arizona Antique Radio Club and the Antique Wireless Association

Spring Meeting
Saturday
April 23, 1988

Ramada - Valley Ho - Hotel
6850 Main Street
Scottsdale, Arizona

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Events

- 9:00 - 11:30 Tour facilities, Antique Electronic Supply
688 W. First Street, Tempe
- 12:00 noon Luncheon - Ramada Hotel, Scottsdale
(Advanced lunch reservations required)
- 1:00 P.M. Welcome and short business meeting
(Pow Wow room)
- 1:30 P.M. Program "The British Collector"
A slide-tape presentation made in England
showing BVWS activity, Science Museum,
Marconi Company and selected early British
receivers.
- 2:30 P.M. Park and Swap - Northwest corner, Ramada
Hotel parking lot

Camelback Rd.

5th Ave.

Indian School

Main Street

SCOTTSDALE

60 St.

69 St.

Ramada - Valley Ho



Thomas

McDowell

Antique Electronic S.

McKellips

Van Buren

Curry Road

First St.

TEMPE

University Dr.

Apache Blvd.

Mill Ave.

Rural Rd.

Scottsdale Rd.

Welcome A.W.A. Members

The members of the Arizona Antique Radio Club welcome all members of the Antique Wireless Association and their spouses or guests to the combined meeting of April 23, 1988. Advance reservations for the noon luncheon are required, with payment of \$10.00 per person mailed to the Radio Club President, George H. Fathauer, 1550 N. Bel Air Drive, Mesa, AZ 85201, by April 18th, 1988. Any questions regarding the meeting or Phoenix area and AARC members, can be directed to any officer listed on the inside cover of the Radio Club News.

We hope the members of the Antique Wireless Association enjoy our Radio Club News. We invite anyone interested in joining the Arizona club, to write to our Secretary-Treasurer, Lois Watson, for an application form.

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JANUARY CLUB MEETING

The program for the January meeting was a tour of Lester Rayner's collection (see photographs on preceeding pages). In addition, several members brought radios or radio related items to show. BERNARD PAYNE brought an Atwater Kent Radiodyne bread-board, a Philmore crystal set, and a Minifon wire recorder set. CHARLES BRELSFORD told the history of the DeForest responder he brought (see the article starting on page 8 and picture on page 11). CLYDE WATSON brought a Zenith midget, a Meissner three tube radio kit in box, an W. K. Aerial and Ground Outfit in box, and a ceramic cookie jar patterned after a 1947 Belmont plastic table model. Members present were; Charles Brelsford, Herbert Clay, George H. Fathauer, Robert Grinder, J. B. Groesser, Tracy Gutherman, James Kelly, Bernard Payne, Lester Rayner, Maury Sievers, Marian Vernon, Robert Vernon, and Clyde Watson.

FEBRUARY CLUB MEETING

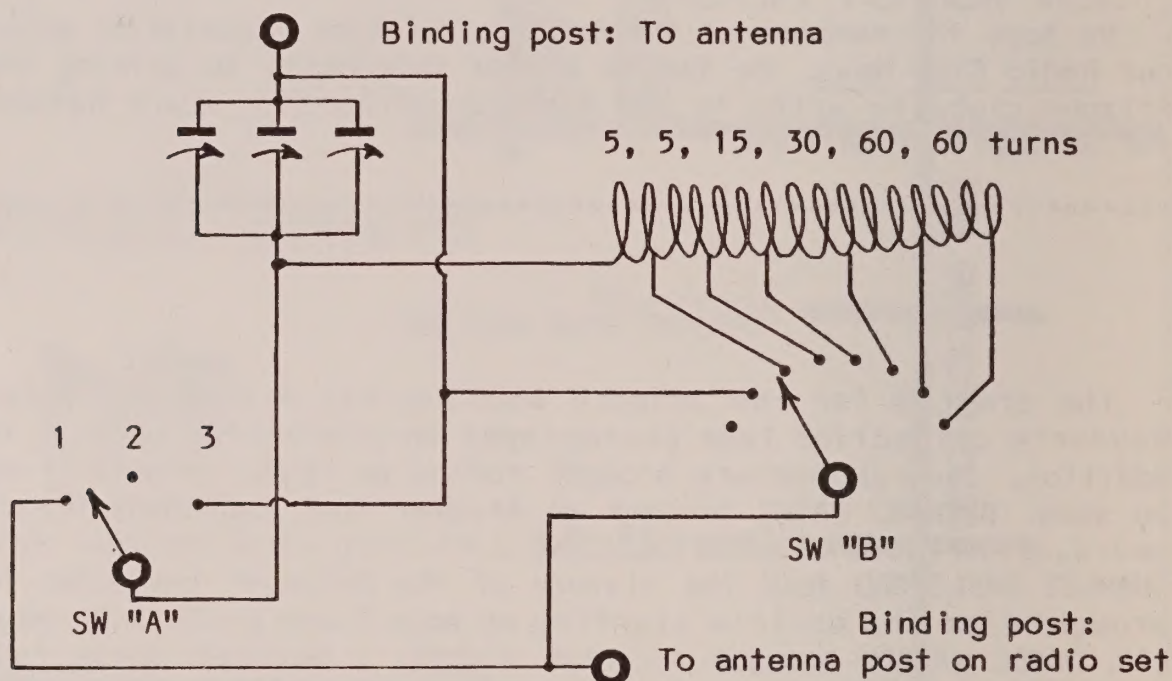
Lincoln Farnsworth, of Mesa, gave an informative talk about his remembrances of his brother Philo Farnsworth, inventor of many of the basic electronic circuits for modern television. (See previous Radio Club News for other articles; more articles will follow in later issues.) His experiences were of great interest to his audience, and warmly received. Members present were: Frank Falkner, George H. Fathauer, Arthur Fisher, Doug Geist, J. B. Groesser, Harry Hyder, James Kelly, Bernard Payne, Lester Rayner, Dorothy Reine, Forest Reine, John Sabo, Maury Sievers, Robert Vernon, Lois Watson, and Clyde Watson.

(Club meeting reports continued on page 15)

Antenna Tuner

FRANK J. FALKNER

Radio enthusiasts who find their early sets overwhelmed by local signals, particularly in populated areas, may find the antenna tuner described here as helpful in controlling incoming signals. The tuner is especially useful with DX receivers like the five tube neutrodynes, Browning-Drake and Roberts Knockout Reflex, etc., and even some superheterodynes.



Switch "A" on #3 bypasses the antenna tuner. Switched to #2, has the effect of shortening a long antenna. On #1, has the effect of lengthening a short antenna. The tuner uses a three gang variable condenser of approximately .001 Mfd, hooked in parallel as shown. The hand wound coil is made of 175 turns of #24 enameled wire on a 3" diameter coil, 5" long. The taps on the coil for switch "B" is from left to right in the diagram, 5, 5, 15, 30, 60 and another 60 turns to the end of the coil.

Testing the Antenna Tuner- Remove the antenna from the radio set, so the radio operates without an antenna. Tune the radio the same way you would when trying to tune in DX - long distance. If you live in a large city, it is likely you will pick up more than one station at a time. The old three dial neutrodynes or TRF receivers ordinarily have unshielded RF coils which often acted as loop antennas. The antenna tuner will help pick up DX stations not blanketed by the locals. Adding an additional wave trap, see below, will also reduce strong signals coming in on the antenna, although it will not eliminate all locals being picked up on the tuning coils already acting as small loop antennas. \$\$

Something About Older Audio Transformers

FRANK J. FALKNER

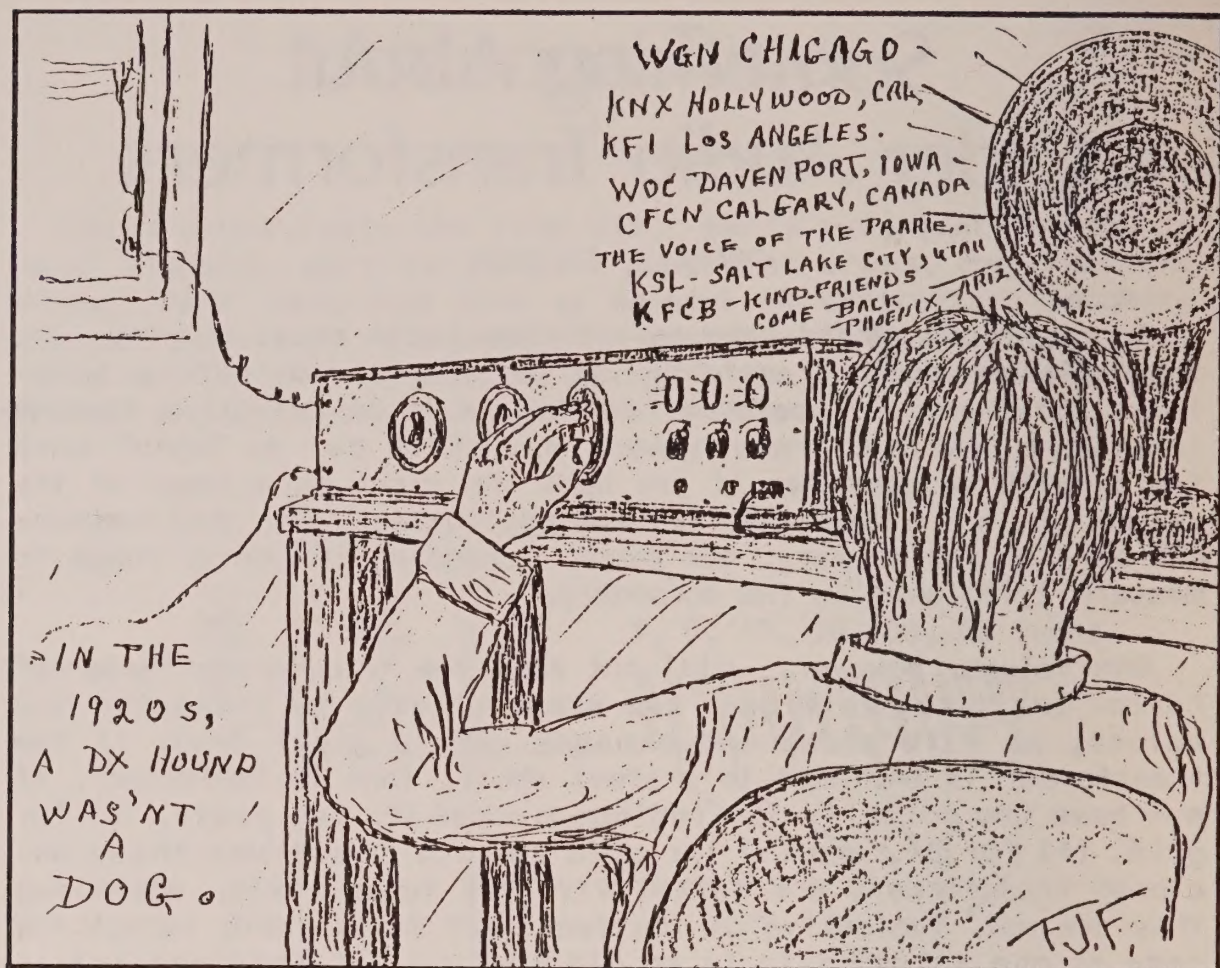
In restoring, or to make an old time radio receiver play, you often find an audio transformer is burnt out or defective. Sometimes, however, a transformer is thought to be defective through inaccurate testing. Transformers may check out as "open" when tested with an ohmmeter if you have the wrong expectancy of the values you will find. Crosley audios, for example, may measure 475 ohms on the primary, but require changing the meter range to measure 7,000 ohms on the secondary.

Ohm values, however, will not show the transformer "step-up" ratio. Don't try to figure the step-up ratio by indicated ohm values, as wire sizes and ohmage vary a great deal. If the transformer is enclosed in a steel shell, that is "shielded", it may have the polarity of windings marked (P) for plate, (G) for grid, (+) for B+, and (-) for grid return. Sometimes these enclosed transformers are marked with the turns ratio, sometimes they are not. Indicative of the fact that turns ratio is not the same as ohm value ratio is an old Rauland All American transformer. It has a ten to one ratio, but measures 550 ohms on the primary, and 12,000 ohms on the secondary. Similarly, an old Jefferson transformer with a three to one ratio, measures 750 ohms on the primary and 4,000 ohms on the secondary. Surprisingly, the lower ratio of the Jefferson will out-amplify the higher ratio of the Rauland and will sound a lot better.

Other examples of ratios and values are: one old Thordarson with a ratio of two to one, measured 1,700 ohms on the primary and 4,500 ohms on the secondary, a second old Thordarson with a ratio of three and a half to one measured 1,250 ohms on the primary and 5,500 on the secondary. A beautiful Music Master transformer with an unknown ratio measured 700 ohms on the primary and 3,500 ohms on the secondary. A much larger Karas Harmonick marked "All Stage Ratio", measured 1,300 ohms on the primary and 9,000 ohms on the secondary.

The correct way of measuring a transformer for ratio is to use a capacity and resistance bridge such as an Eico Model 950B or similar test instrument. Hooked to the bridge, you will get a step-down or a step-up ratio - but you will get a true ratio.

Remember, however, the higher ratio is not generally desirable, as it does not give higher volume as might be expected. A good quality low ratio transformer will always sound much better than any high ratio transformer, and will deliver better volume.



Drawing by Frank J. Falkner

A transformer without a shielding shell should not be placed close to another audio transformer as each will interfere with the operation of the other and give distortion in the signal. Rotating the axis of the transformers so that they set at right angles to one another will often help, and I have seen old radios with the audios widely separated with one transformer on one end of the chassis and the other at the opposite end. The old Crosley Model 3R3 had the audios spaced eighteen inches apart. The transformers had high step-up ratios, and even with this wide spacing still had high distortion introduced through the audios.

Old battery radios used a grid leak condenser which started over-loading on any signal that exceeded one tenth of a volt. The higher the voltages on these condensers the higher the resultant distortion of the signal. Consider, for example, the following arrangement of 01A tubes as detector and audio amplifiers. An 01A tube amplified a signal approximately six times, so a tenth of a volt on the grid of the detector tube became six tenths on the plate. If the first audio transformer had a five to one ratio, there would be three volts on the grid of the first audio tube. Amplified six times, the plate of this tube would stand at eighteen volts. This eighteen volts ran into a three to one second audio, as they often did in those sets, became fifty-four

use only the headphone jack that was provided after the detector or first audio plate circuit. Yet another way was to put a volume control in the grid circuit of the first audio tube. A potentiometer of 0 to 500,000 ohms works well.

Another contributing factor to the distortion radio owners experienced in those days, came from the speakers available. Horn speakers reproduced the human voice of 300 to 3,000 cycles pretty well, but not the higher and lower ranges of music. The most effective response of earphones was at about 1,000 cycles. Since most horn speakers had something like an earphone as a driver, they responded best within these human voice frequencies. Around 1927, paper cone speakers became more popular. They had a much better sound, in part because they incorporated a better arrangement for a driver.

Some engineers sought to solve the distortion problem in the sets by turning to resistance coupling. Among some of their proposals was that the set needed one hundred and eighty "B" volts, and three 01A tubes to equal the gain of a two-staged audio amplifier which is transformer coupled. The engineers, however, could not agree as to what the resistance values should be, nor on what the coupling condenser values should be. This resulted in a new look at audio transformers, and low ratio transformers with larger iron cores became popular for a while.

With the introduction of screen grid tubes, resistance coupling was the only way to go. Audio transformers did not work well with the new screen grid tube, and the combination of resistance coupling with the screen grid did improve sound quality considerably. The tone quality of sets constructed with these components turned attention again to improving loudspeakers to equal this advancement in sound quality. \$\$

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The DeForest Responder

Charles M. Brelsford, K2WW

To understand the significance of the deForest responder the reader of this article should know something of the history of early wireless. In the early days "Radio" was known as "WIRELESS". It was a system of sending telegraph code signals without the use of connecting wires. In 1887 a young German student, Heinrich Hertz, discovered a means for detecting electromagnetic waves after they had been transmitted across space. In his experiment, he made a spark jump across a gap in a similar loop of wire located nearby.

Commencing in 1894, an Italian youth named Guglielmo Marconi adapted the inventions of many other men and combined them into a workable communication system. He used Righi's version of the Hertzian oscillator for his transmitter. For his detector he used the coherer discovered by Hughes in 1878, later re-discovered by Branley. He modified Loomis' aerial to radiate electromagnetic oscillations along the surface of the earth. In 1896 he demonstrated his system to the British by sending and receiving messages over a distance of two miles. When transmitting his aerial was connected directly to the spark gap, and when receiving it was connected directly to the coherer detector.

The coherer is a small tube filled with metal filings. A metal plug fits in each end. Normally the resistance across it is very high, in the megohms, but when a signal is impressed upon it the resistance drops very low allowing a local current to flow and operate a relay and recorder.

In 1901, Lee deForest, a 1899 graduate of Yale University, founded the deForest Wireless Telegraph Company to manufacture wireless equipment and operate wireless stations. Until 1902 the coherer was the only detector in use at which time the Marconi Company introduced the magnetic detector and Fessenden invented the electrolytic detector. Each of these devices was superior to the coherer. The electrolytic detector operated by inserting the tip of a platinum wire into a small cup of acid.

In 1903, deForest made a "spade" electrolytic detector which he called the "responder" and which he put into commercial use. DeForest was sued by Fessenden for patent infringement for using the electrolytic detector. In 1906 the court ordered deForest to stop using it. At that time General H. H. Dunwoody, previously of the Signal Corps, was an officer of the deForest Company and had been granted a patent for the use of a carborundum crystal for a wireless detector. So, although its sensitivity was not too great, deForest substituted the carborundum crystal for the "spade" detector.

The late Thorn Mayes, a notable historian writes:

"This has been an expensive suit so deForest was called into President White's office for an explanation. DeForest resigned as chief engineer of the American deForest Wireless Telegraph Company and was given severance pay of \$1,000 which covered his many patents, excepting those on the vacuum tube detector which were considered worthless at that time. The electrolytic detector had a short life, as it was soon replaced by the development of galena, silicon and other crystal detectors which were much more sensitive and stable in operation than the electrolytic detector."

In 1904, Fleming invented the two-element valve and in 1906 deForest patented the three-element audion as a non-oscillating

detector/amplifier.

DeForest in 1903 provided the U.S. Navy with his "Responder" (The picture on the opposite page shows such a unit). The late Richard Howe writes about this electrolytic detector as follows:

"In 1903 one Austin Parkhurst was an electrician in the Navy and was stationed at the Brooklyn Navy Yard. DeForest had just brought out his new "Responder" and the Navy borrowed one from deForest to try out. During the period in which the original deForest was being tried, a Navy shop man made a copy of the original deForest unit. The unit shown in the picture is that copy of the original unit made by the Navy shop man, in 1903. It was 'rescued' by electrician Parkhurst when he left the Navy and remained in his possession until he was persuaded ... to place it in the radio museum of the Denison University Radio Club of Granville, Ohio."

The responder is now in my possession.

There is no name plate on the unit. Whether this was the copy or original I am not completely sure, for there two small nail holes on the side where a plate might have been. Either way, it is a unique collector's item.

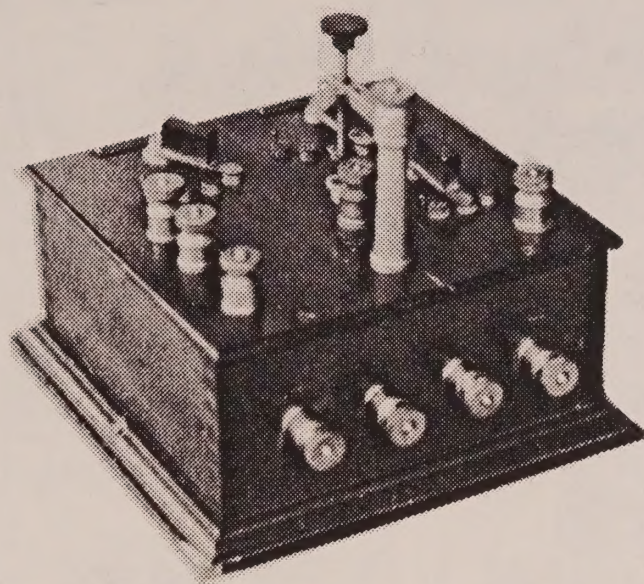
In the 1966-67 Old Timer's Bulletin, Vol. 7, No. 4, of the Antique Wireless Association, the late Lincoln Cundall reports on results using this Responder. He reported the sensitivity about equal to that of a crystal detector. Also, he quoted interesting figures on the sensitivity of several detectors according to Fessenden and Pickard as follows:

<u>Detector Type</u>	<u>Energy - Ergs per dot</u>
Magnetic Detector	.0100
Carborundum	.0090
Electrolytic	.0036
Silicon	.0004

(Continued on page 23, for wiring of the Responder.)

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The Responder in Charles Brelsford's possession, is pictured on the opposite page. Pictured in one photograph, Charles is discussing the Responder with Maury Sievers, with George H. Fathauer looking on. In the bottom photograph, Robert Grinder, Robert Vernon, Herbert Clay, and Bernard Payne also engage in the discussion on the Responder. Several other members attending the January meeting, are not pictured.





The January meeting included a tour of Lester Rayner's collection. (Above) Les listens to a question from Bernard Payne - Chuck Brelsford and James Kelly listen in. (Left) Les tunes his 1935 Midwest, 16 tube, Super Deluxe All-Wave, 9 to 2400 meters.

ARIZONA ANTIQUE RADIO CLUB and
COMBINED MEETING, SATURDAY, APRIL

ADVANCED RESERVATIONS

Executive lunch: Soup, ham and cheese
12:00 NOON, RAMAMDA INN - VICTORIA

NAME _____

ADDRESS _____

CITY _____

GUEST _____

NUMBER OF LUNCHEON RESERVATIONS _____
(Includes lunch, gratuities and use of

Make check to ARIZONA ANTIQUE

GEORGE H. FATHAUER, 1550 N. 10TH

By APRIL 15

ANTIQUE WIRELESS ASSOCIATION
23, 1988 - SCOTTSDALE ARIZONA

OR LUNCHEON REQUIRED
croissant sandwich with cole slaw.
LEY HO, SCOTTSDALE, ARIZONA

PHONE ()

STATE ZIP

AT \$10:00
(meeting room)

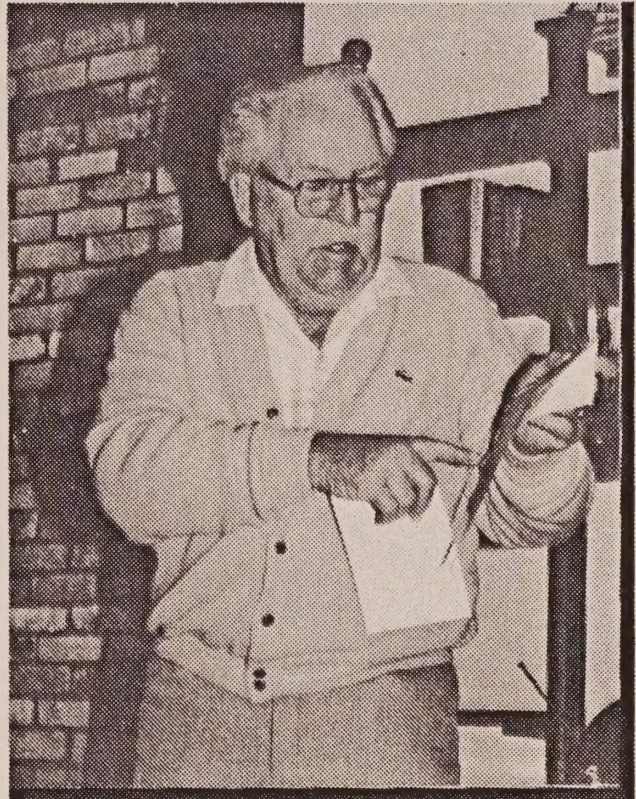
E RADIO CLUB, and send to:

L AIR DRIVE, MESA, AZ 85201

8TH, 1988

Club Meetings

At the February meeting. Lincoln Farnsworth of Mesa, gave personal accounts of his brother Philo Taylor Farnsworth inventor of the basic concepts of electronic television. Lincoln's remembrances were of great interest to his audience, and his talk was warmly recieved and greatly appreciated.





Pictured on opposite page are additional pictures of AARC members. Upper left, J. B. GROESSER of Tucson; below, JOHN SABO of Mesa; and to the right, TRACY GUNDERMAN of Phoenix. Below in group picture, Charles Brelsford, Bernard Payne and James Kelly look on as Lester Rayner explains one of his pieces.
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DOUG GEIST - a beginning collector, is interested in acquiring a few more early radios. Anyone interested in selling portions of their collection, please keep Doug in mind. His telephone number is (602) 969-1719.

FREDRIC M. LONDON - a new member, is looking for a combination battery radio with a wind-up phonograph. If anyone has a set they might be willing to part with, contact Fred at (602) 345-1091 or write to 3716 South Country Club Way, Tempe, AZ, 85282.

BERNARD PAYNE - is looking for a DeForest Spherical Audion in any condition. Contact Bernard at (403) 281-4341 in Canada, or during winter months (602) 924-9429 in Meza, AZ.

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(Club meeting reports, continued from page 3)

MARCH CLUB MEETING

The program of the March meeting was the showing of the first two half-hour segments of the Mike Adam's television series, Radio Collector. In addition, Bernard Payne played a home video tape of his very impressive radio and telephone collection in his home at Calgary, Canada. DOUG GLEST brought a couple of late 1930s wood table model radios for the group to see. He is missing one unusual knob. JOHN SABO brought an early 1920s National Airphone Monodyne, model GT-1, with the original box. The one tube detector used a DeForest WD-12. John also had acquired a matching one tube amplifier. Both units were made of bakelite, and in good shape. Maury Sievers displayed a one tube crystal set he had commissioned Frank Falkner to build for him. Bernard Payne carefully passed around a Fleming valve, and showed a nice "broadcast mike" promotional radio he had found recently in Arizona. George H. Fathauer had brought another unusual tube, a Speed 291 "triple twin". He also had a French tube a Metal R-3 valve, and a crystal "pocket phone" radio built into a headphone. Members present were: George H. Fathauer, Frank Falkner, Doug Geist, Robert Grinder, Harry Hyder, James Kelly, Bill Lettow, Bernard Payne, Lester Rayner, Dorothy Reine, Forest Reine, Maury Sievers, Robert Vernon and Clyde Watson.

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The cover of this issue of the Radio Club News, borrows an illustration from the 1931 catalog of the Allied Radio Corp. then of 711 W. Lake St. or 1908 Pershing Rd., Chicago, Ill. Catalog in the possession of John Sabo.

Time by Radio

Harry R. Hyder

Anyone who has ever owned a short wave radio receiver has probably tuned to the time signals broadcast on various frequencies by WWV, the National Bureau of Standards station. Similar time signals are broadcast by most of the industrialized nations of the world.

When radio started in the early years of this century, it was used almost exclusively for ship-to-shore and ship-to-ship communication. It was rapidly realized that the broadcast of accurate time signals would be a valuable aid to mariners, allowing navigators to check their chronometers, thus permitting more accurate determination of positions.

As far as I know, the first time signals from this country were broadcast in 1905 by a U.S. Navy station in Boston. The operation was manual, by telegraph key. Shortly thereafter, the time signal was transferred to NAA, the more powerful Navy station in Arlington, Va. The transmission was automated, with signals received from the U.S. Naval Observatory.

It is interesting that in those pre-WWI days, many jewelers and watchmakers bought the primitive radio receivers of the day specifically to hear NAA's time signals.

During the 1920s, The National Bureau of Standards became the Nation's official timekeeper. Station WWV was set up specifically to transmit continuous time and frequency signals. Highly stable crystal oscillations were used to mark minutes and seconds, with periodic corrections from the Naval Observatory. As time went on, there was an interesting demand for more and more accurate time signals, principally for scientific purposes rather than navigation.

Up until the 1950s, the determination of time was exclusively by astronomical observation. However, computing time on the motions of the earth on its axis and in its orbital path around the sun is really quite complex. First there is precession. The axis of the earth when projected into space describes a circle of $23\frac{1}{2}$ degrees, with a period of 26,000 years. This is why Ursea Minoris, which what we call the North Star (Polaris) has been gradually moving away from the true north. In 3,000 BC, Alpha Draconis was the north star, and in 13,000 AD it will be Vega. Superimposed upon precession is a smaller, more rapid oscillation called nutation.

In addition, the orbit of the earth around the sun is not circular, but elliptical. When the earth is closest to the sun it is moving faster than when it is farthest from the sun. This

makes an apparent difference in the length of the day, amounting to 16 minutes in November.

These three effects have been known and accounted for since the days of Kepler and Newton. However, astronomers discovered over the years that even after precession, nutation and ellipticity were taken into account, there was still a slight irregularity in the length of the day. We now believe that most of this is due to the seasonal buildup and melting of ice in the earth's polar regions. Considering this factor, leaves only a tiny irregularity in accurate time unaccounted for.

Scientists long realized that it would be useful to have a standard of time that was independent of the motion of the earth, and during the 1950s the atomic time standard was developed. Of the atomic instruments developed, the hydrogen maser (Micro Amplification by Stimulated Emission of Radiation) is the most accurate of all, but it is bulky and expensive to maintain. The maser is primarily a laboratory instrument. The caesium beam standard is a more practical device. It is also relatively inexpensive at \$35,000.

The caesium beam standard counts transitions between two energy levels of the caesium 133 atom. The frequency of these transitions is 9,192,631,770 Hz. These are counted down to a more useable range by conventional electronic means.

The atomic standard was adopted internationally in 1967, and all nations transmitting time signals now use it to determine time. However, it is still useful to have time refer to the movement of the earth, which determines the day and year. This is where the "leap second" comes in. When the difference between the atomic time and astronomical time approaches one second, one second is added to or subtracted from standard time. This is done on June 30 or December 31. I have seen it noted in newspapers.

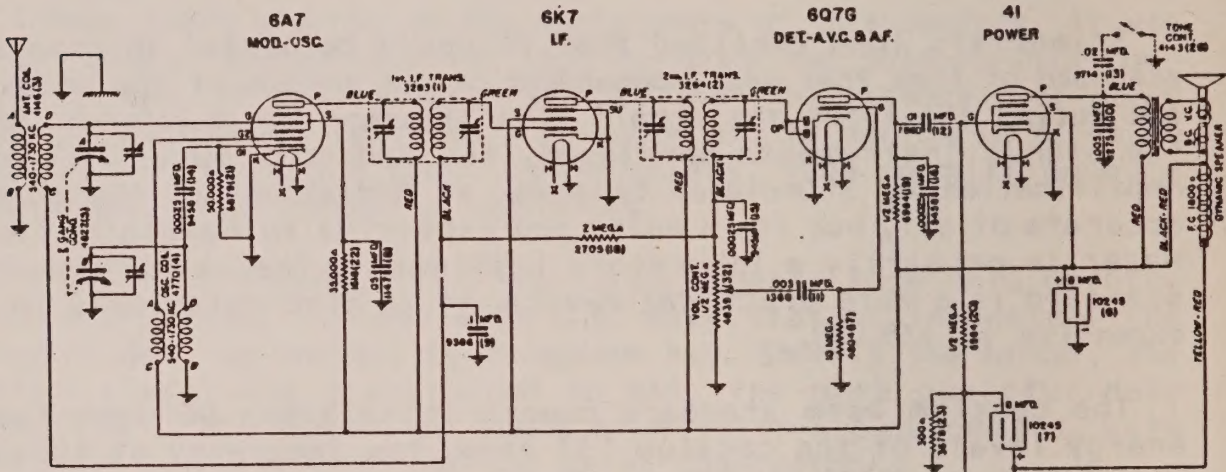
The time we receive on WWV is called UTC, or Universal Coordinated Time. Coordination of time, from agencies all over the world, is handled by the Bureau International de L'Heure (BHI) in Paris.

So, is the time we get from WWV in Fort Collins, Colorado the actual time? Not quite. What we receive is the correct time when it was transmitted. It takes some time for the signal to reach us, and on short waves this is somewhat unpredictable although it is never wrong by more than a couple of milliseconds. The NBS sends its most accurate time signal over WWVB on 60 KHz. This is beyond the range of most home-type receivers. On 60 KHz the actual time delay to a receiver is quite predictable, and can be taken into account at any receiving location where the highest accuracy is required. However, obviously for most of us, any time signal we receive is good enough for setting our watch. \$\$

What is a Radio?- Part III

George H. Fathauer

In this series of "What is a Radio? - Part II" in the last Radio Club News, answered the question of what is basic and essentially standard for all AM radios including the latest solid state versions. The superheterodyne circuit in the figure below, is an example of all basic radio circuits in use today.



There have been many significant "extras" incorporated in superheterodyne radios through the years, and these need to be recognized for a more thorough understanding of later circuit operation. Listed below are many of these "extras" with a brief description of their functions.

A. Tone Controls - Radios as early as the Grebe MU-1 (1924) used a switched capacitor to attenuate the higher audio frequencies (This is also used in above figure). A common arrangement in later superhets used switched resistors and capacitors connected to a volume control tap. This attenuates low and mid-range frequencies at low to moderate volume control settings for a bass boost characteristic.

B. Short Wave - Many radios in the 30s and 40s used switches to change the antenna and oscillator coil taps for coverage of other frequency bands. This appears to make the circuit very complicated but actually doesn't change the basic radio operating circuit.

C. Built-in Antennas - Loop antennas were used in radios as early as 1924 but had to be large and inconvenient because of the low gain of radios. With sensitive superheterodynes, smaller loops are adequate and were commonly used from the late 30s on. Electrically, the loop antenna is simply a larger antenna coil (secondary side in the above figure) tuned by the main tuning condensor. The development of coils wound on a low loss ferrite rod, lead to smaller loop antennas. Those used during the 1950s

provided small radios with high sensitivity, but induction value matching was highly critical.

D. Push-Pull Audio Output - This arrangement uses two output tubes, sometimes four in push-pull parallel, in phase opposition. This provided more than twice the audio power with cancellation of odd-order harmonic distortion and improved low frequency response by cancellation of plate current in the output transformer. Push-pull operation requires the addition of an audio amplifier tube for a phase inverted input or an input transformer.

E. Added I.F. Amplifier Stage - This uses an additional I.F. transformer and amplifier tube cascaded between the first and second detector. The extra gain is not usable with conventional I.F. transformers, however, many "top-of-the-line" sets used this along with a switch or mechanical arrangement to adjust the I.F. transformer coupling. Loose coupling is used for high selectivity while close coupling increase the I.F. band-width and therefore the overall output frequency response.

F. R.F. Amplifier Stage - This is simply a tuned R.F. filter amplifying tube ahead of the first detector. By providing additional R.F. selectivity, spurious responses are greatly reduced. This circuit feature is most useful for short wave reception.

G. Automatic Tuning Early - Such "automatic tuning" systems used mechanical arrangements to drive the tuning condenser to pre-set positions. Some "automatic" schemes used moveable contacts on a tuning rotor to indicate with lights when certain positions were reached. More sophisticated systems used motors to drive the tuning system. Late 1930s radios achieved push-button automatic tuning by the electrical switching in of pre-tuned antenna and oscillator circuits.

H. Automatic Tuning Indicators - Indicators were added to radio sets to tell the user when a radio was tuned to the center of the frequency pass-band. Early schemes used meters with pointers or light shadows operated by changes in I.F. amplifier current with similar changes in AVC voltage. From the mid 1930s to late 1940s, tuning "eyes" were used. These were typically type 6E5 or 6U5 tubes with a green flourescent eye shadow open and closed by changes in the AVC voltage.

I. Automatic Frequency Control - A feature which uses a frequency discriminator to control a reactance tube to pull the local oscillator frequency. This was used in very few AM radios.

Other refinements were developed that were not applicable to entertainment receivers, but were particularly applicable to communication recievers. These include a noise clipping circuit, double I.F. conversion, and beat frequency oscillators. \$\$

INSTRUCTIONS

for the

RCA CATHODE RAY TUNING KIT

Stock No. 9688

1. Introduction

The RCA Cathode Ray Tuning Kit is a new aid to exact tuning in radio receivers. It shows visually the ideal tuning point for best reception (resonance) on each individual signal. In addition, it makes possible silent tuning, which means that the station you select may be precisely tuned-in before the volume

control is turned up.

This visible tuning indicator in kit form is prepared for installation on radio receivers equipped with standard diode automatic volume control.

Have your service engineer attach it to your receiver and your trouble in obtaining the exact tuning point for the best reception of any program will no longer exist.

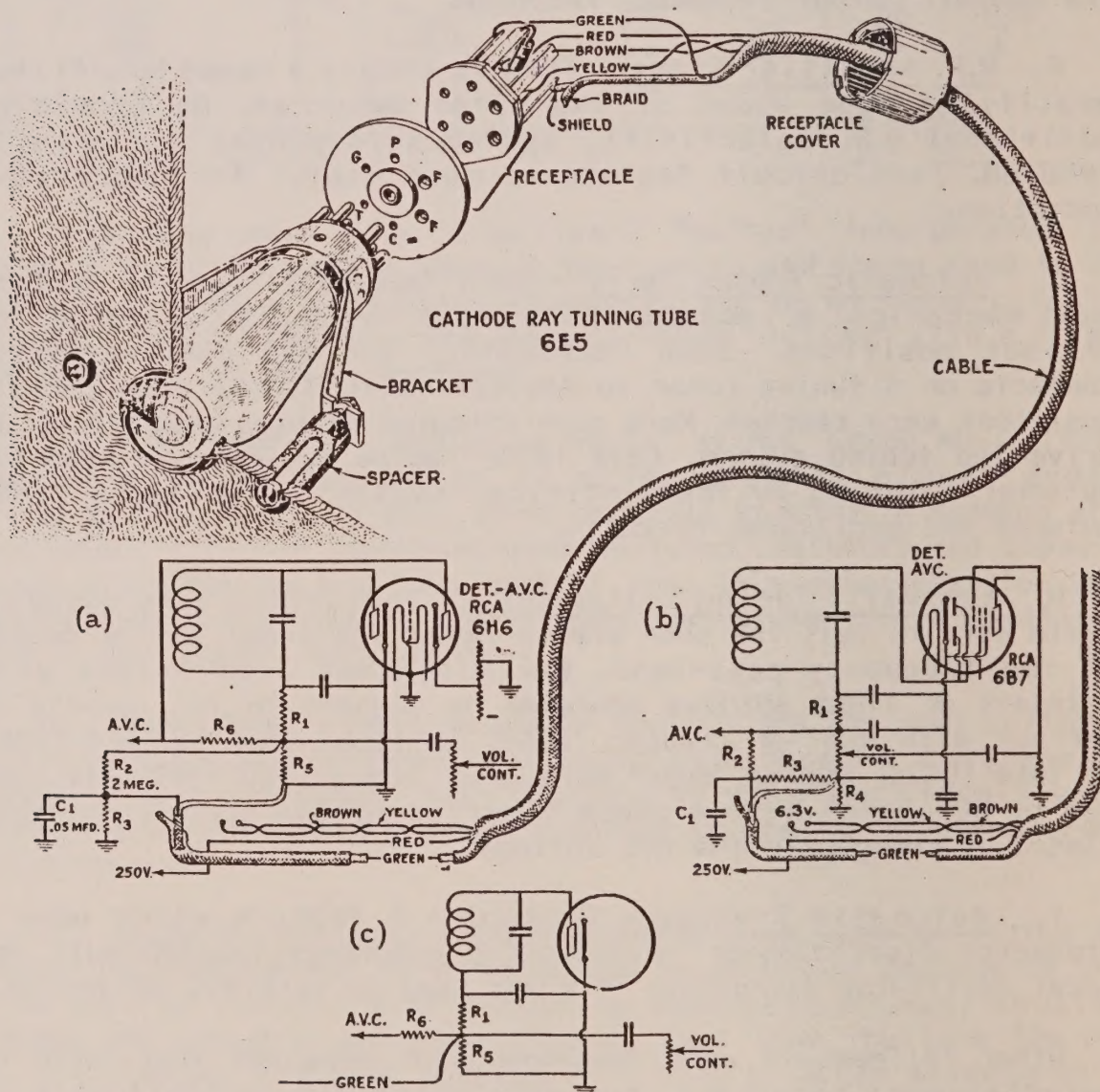


Figure 1—Cathode Ray Tuning Tube and Connections

2. Operation

The Tuning Kit will be found to be particularly effective on strong signals such as standard broadcasts.

To tune with the Cathode Ray Kit, first proceed in accordance with the operating instructions for your receiver. Then watch the Cathode Ray Tuning Tube as you rotate the Tuning Control knob backward and forward. The station is perfectly tuned in when the darker illuminated area is at its narrowest.

Silent tuning may be obtained by turning the Volume Control knob down, rotating Tuning Control to approximate scale reading for station, and then making final adjustments slowly and carefully to bring the dark green area to a minimum. Turn up the Volume Control to give the required volume of program.

3. Description

The Cathode Ray Tuning Kit, as sold, consists of the following items:

- (a) One RCA-6E5 Electron-Ray Tube.
- (b) One Eye-Type Escutcheon.
- (c) One Cable and Socket Assembly with resistor.
- (d) One Mounting Bracket and Clamp Assembly.
- (e) Two Drilled Wooden Spacers for Mounting Bracket.
- (f) Two Mounting Screws.
- (g) Two Front Panel Washers.
- (h) Nuts and Washers for Panel Attachment.
- (i) One Rubber Gasket for Securing Top of Tube in Escutcheon.

Auxiliary equipment may be required to suit your particular receiver, and this may be obtained from your distributor. It includes:

- (a) Resistors—One of approximately two megohms (R-2); another of same, greater or less value (R-3).
- (b) Capacitor—One of 0.05 microfarad value (C-1).
- (c) Mounting Bracket with Insulating Strip and Lug for soldering to chassis and attachment of Resistors and Capacitor.
- (d) Transformer for use where the 2-volt instead of the 6.3-volt tubes are used on the receiver.

The tube mounting bracket may be bent and attached to the chassis, or the electron-ray tube may be mounted on a separate panel or in an ornamental box according to particular taste and convenience.

4. Installation

For installation and attachment to the cabinet panel of any radio receiver it will be necessary to drill three holes in the cabinet and then make several soldered connections to the chassis.

The complete procedure is as follows:

- (a) Choose location for mounting the RCA-6E5 tube and cable, giving due consideration to ample space for mounting bracket, and freedom of cable from tuning condenser, grid caps, loudspeaker, and other receiver parts.
- (b) Remove chassis complete from the receiver.
- (c) Locate accurately the center points for the bracket and Cathode Ray tube. Drill three holes, one $1\frac{1}{4}$ -inch diameter for escutcheon, and two $\frac{1}{8}$ -inch diameter for bracket mounting screws.
- (d) Insert the escutcheon in place in the $1\frac{1}{4}$ -inch hole. It is advisable to make a few center punched indentations on the slotted flange to hold the escutcheon firmly to the cabinet.
- (e) Assemble screws, washers, and wooden spacers on the cabinet. The spacers are for $\frac{1}{4}$ -inch cabinet wall and must be cut down if mounting wall is of greater thickness.
- (f) Insert end of RCA-6E5 radiotron with rubber gasket in place in the escutcheon in correct position for "casting shadow" in lower part of "eye." This means that the arrow on the base of the tube must point to left when looking at prongs from back of cabinet. Then assemble bracket in place on radiotron.
- (g) Locate AVC-Detector-tube socket on chassis and decide positions for the cable hole and soldered attachments of the five cable connections; also location for mounting resistors and capacitor, if required.
- (h) Drill a $\frac{3}{8}$ -inch hole in chassis, thread cable through and make the required soldered connections (see illustration).
 - (1) The *brown* and *yellow* heater leads are soldered to any 6.3-volt filament supply, or to a separate 6.3-volt transformer when filament supply of receiver is 2.5 volts. (If a separate transformer is used, the center tap of the secondary winding, or one side of filament supply winding, must be grounded.)
 - (2) The *red* lead is soldered to a convenient point of 200-250-volt plate supply (B) in i-f, a-f, or r-f circuits.
 - (3) The *green* shielded lead is connected in AVC circuit, usually to the terminal of resistor (marked R-1—Figure 1 (c)) in the secondary circuit of the last i-f transformer. Auxiliary resistors and capacitor R-2, R-3 and C-1, when required, are connected to this lead, as shown in the diagrams (a) and (b), Figure 1. An "overlapping deflection" when tuned to a station means that the circuit illus-

trated in (a) or (b), Figure 1, is required.

- (4) The *black* shield or cathode lead is either grounded or connected to the terminal of the resistor shown as R-4, according to particular receiver circuit.

It is advisable to arrange with your dealer for a service engineer to make the installation on your receiver, adjust it to your requirements and demonstrate its use and value.

portional to the variations in width of the darker sector or "shadow" on the tuning tube target. The flatness of the slope is therefore a measure of the range of incoming signal strength over which the tube is of service for tuning. The auxiliary resistors and capacitor should be such as to give operation over the signal range most used. Curve A is for a receiver with poor AVC, whereas Curve B is that of a de luxe RCA receiver.

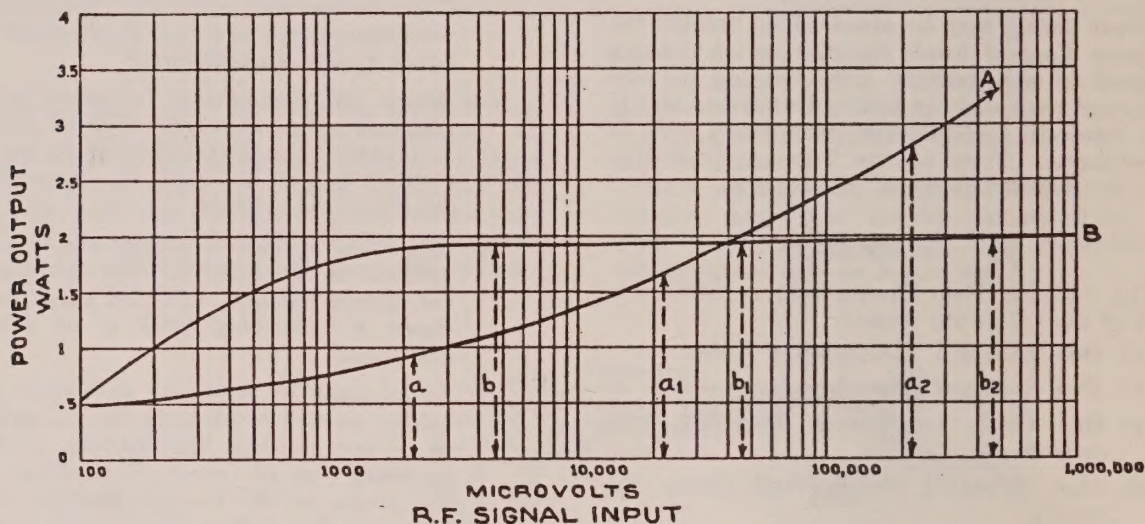


Figure 2—Automatic Volume Controls

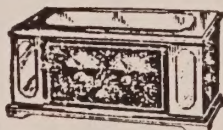
5. Performance

The signal strength range over which the electron-ray-tuning tube gives effective performance depends on the AVC slope for the particular receiver, as illustrated by the following curve.

The ordinates a , a_1 , a_2 , or b , b_1 , b_2 , are pro-

6 Service.

Ineffective operation should be called to the attention of your dealer or service engineer who has installed the kit on your receiver. In certain cases an improvement for clearer indication for particular stations may be made. Remember to keep your receiver in good operating condition by having your dealer or service engineer make periodical examinations.



Antique Radio and Repair

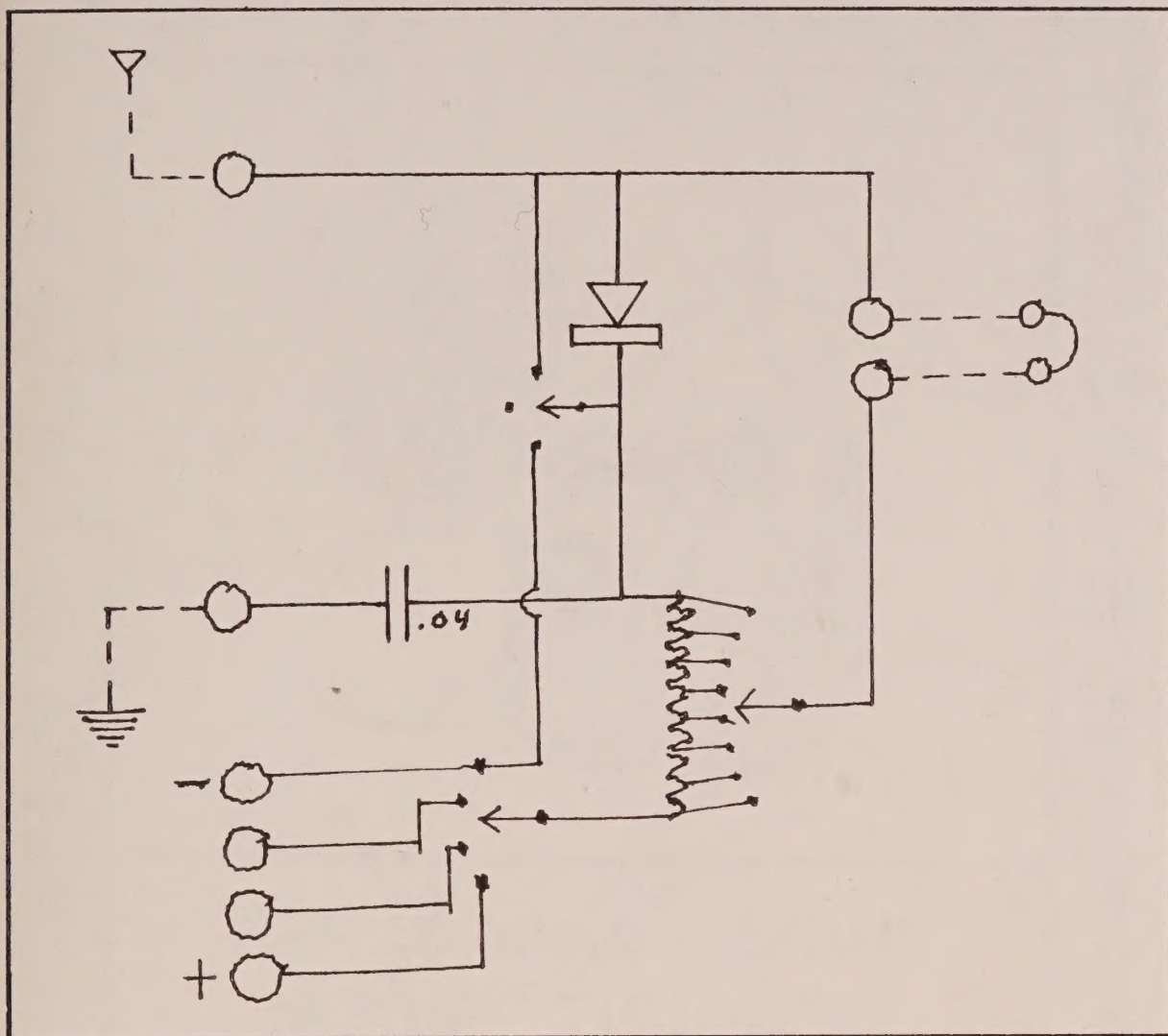
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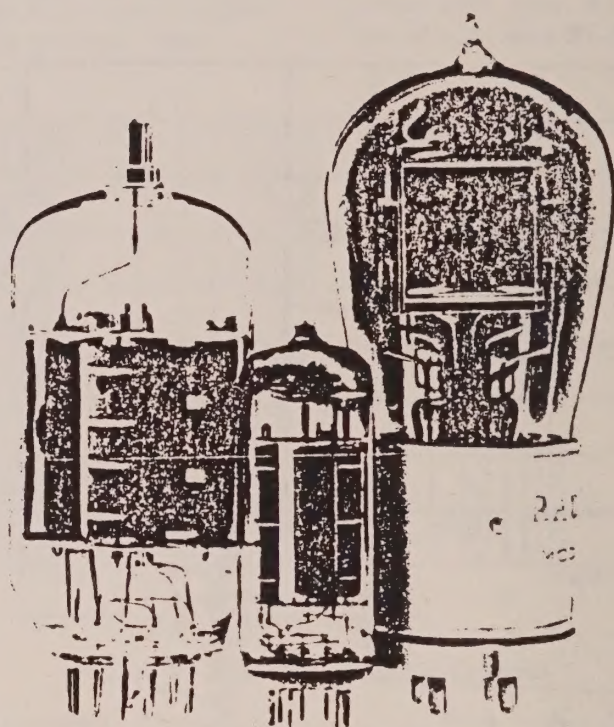
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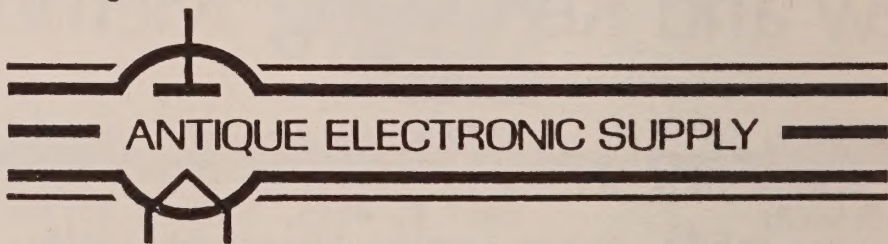
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September 5th.
March 5th.

December 5th.
June 5th.

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For the benefit of our members, advertising is provided FREE to members and to qualifying non-members in the BUY, SELL or TRADE section. Members are entitled to one ad of 30 words each issue. Qualifying non-members, those who have a one-time radio artifact(s) for sale or trade, may place one ad of 30 words once during a calendar year. DISPLAY advertising is available to both members and non-members. Camera ready material is charged at an issue rate of \$60.00 per 5 1/2" x 8 1/2" page; divisible up to one-sixth of a page. When requested, the editor will assist in the preparation of display advertising, but any charges by the printer for halftones, typesetting, or reductions must be borne by the advertiser. A 20% discount is offered on repeated ads.

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